



Columbia Water and Light

Comprehensive Water Cost of Service Study

Final Report / August 27, 2018



August 27, 2018

Mr. Ryan Williams
Assistant Director of Water and Light
City of Columbia
701 E Broadway
Columbia, MO 65201

Subject: Water Financial Plan Study Report

Dear Mr. Williams,

Raftelis Financial Consultants, Inc. (Raftelis) is pleased to provide this Water Financial Plan Study Report (Report) for the City of Columbia (City) to address current financial challenges the City is facing and to establish water rates that are equitable and sufficient.

The major objectives of the study include the following:

- » Develop a financial plan for the water enterprise to ensure financial sufficiency, meet operation and maintenance (O&M) costs, ensure sufficient funding for capital replacement and refurbishment (R&R) needs, and improve the financial health of the enterprise
- » Ensure adequate coverage and future revenues for a new bond issue
- » Review current rate structures for the water enterprise.

The Report summarizes the key findings and recommendations related to the development of the financial plan for the water utility and the development of the updated water rates.

It has been a pleasure working with you, and we thank you and the City staff for the support provided during the course of this study.

Sincerely,

RAFTELIS FINANCIAL CONSULTANTS, INC.

Thomas Beckley
Senior Manager

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EXECUTIVE SUMMARY

Objectives of the Study

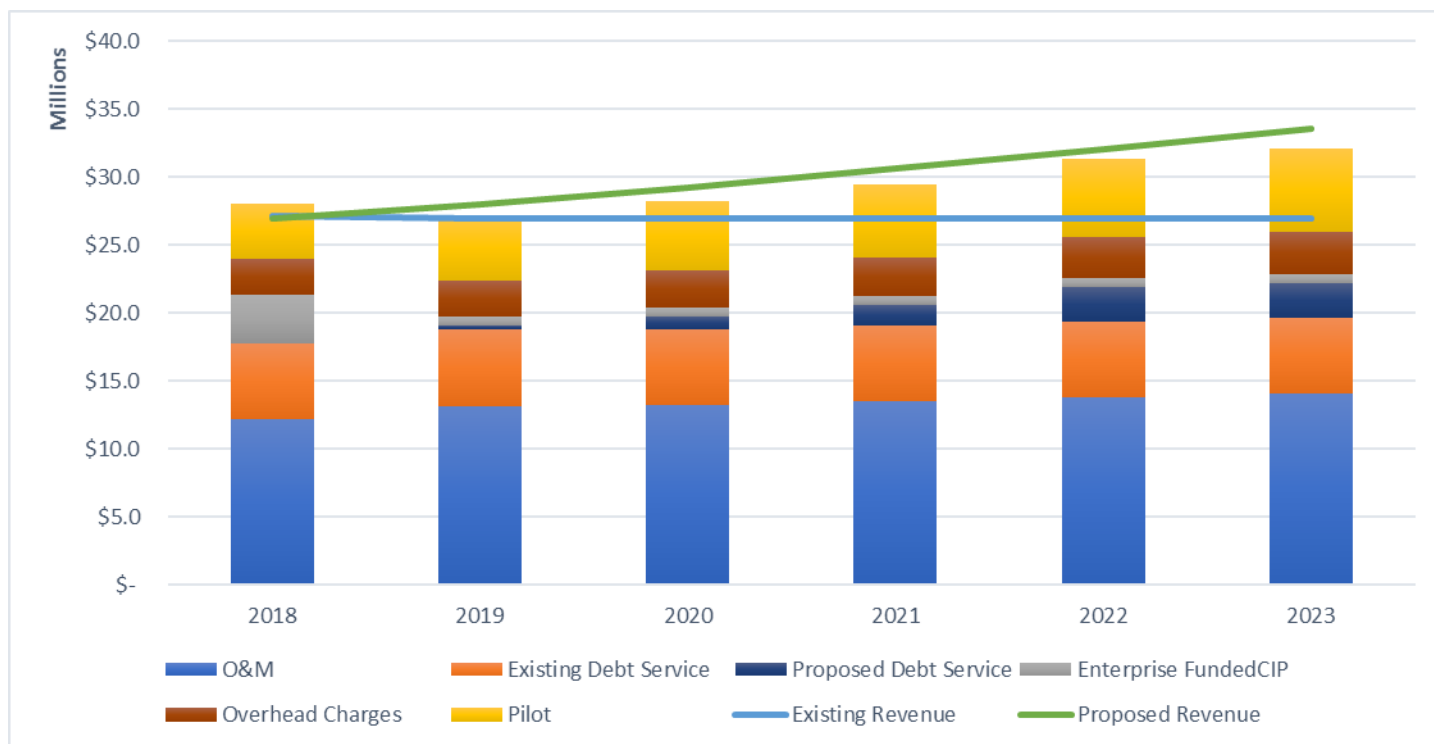
The major objectives of the study include the following:

- » Develop financial plans for the water enterprise to ensure financial sufficiency, meet operation and maintenance (O&M) costs, ensure sufficient funding for capital replacement and refurbishment (R&R) needs, and improve the financial health of the enterprise
- » Review current and potential future rate structures for the water enterprise

EXISTING RATE REVENUES

Figure A compares the forecast revenue based on existing water rates with the forecast revenue requirements. With forecasted revenues of just below \$27 million, the water utility cannot sufficiently recover the forecast revenue requirements of above \$27 million in the next fiscal year. Due to increasing capital spending in the future, increased overhead charges and payments in lieu of taxes, and the need to maintain a minimum fund balance, revenues at existing rates are insufficient beginning in FY18. **Raftelis recommends 5% annual rate increases for the remainder of the forecast period.**

Figure A: Water Revenue Sufficiency



RATE SETTING OBJECTIVES

An important part of the Study was to establish the rate setting objectives considered most important by CWL staff, the CWL advisory board, and the Columbia City Council. Raftelis conducted separate work sessions with each group to determine the relative level of importance of each potential objective identified during the work sessions. Figure B lists the different objectives RFC discussed with work session attendees.

Figure B: Rate Setting Objectives



Attendees of each work session were provided worksheets and asked to rate each objective as “Essential”, “Very Important”, “Important” or “Least Important”. After the exercise was completed, the individual worksheets were used to determine which three objectives were deemed most essential to the attendees of each work session. Overall, stakeholders valued water conservation.

PROPOSED RATE STRUCTURE CHANGES

Raftelis proposes adding a third tier at a rate double the second tier. The third tier would apply to all usage above 8 Ccf¹ for residential customers and all usage above 170% of average winter consumption² for all other classes. This would send a strong pricing signal that CWL values water conservation and would recover more costs from the customers who place the highest demands on the system. Figure C shows the proposed rate structure for inside city residential customers.

¹ 1 Ccf = 100 cubic feet = 748 gallons.

² The winter period is January, February, and March.

Figure C: Forecast of Proposed Volume Rates (per Ccf)

Inside City	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
<i>Residential</i>						
Tier 1 (0-2 Ccf)	\$ 2.79	\$ 2.79	\$ 2.91	\$ 3.03	\$ 3.16	\$ 3.32
Tier 2 (3-8 Ccf)	3.91	3.91	4.11	4.32	4.54	4.77
Tier 3 (Above 8 Ccf)	-	7.82	8.22	8.64	9.08	9.54

CUSTOMER BILL IMPACTS

The following Figures show the impact of the new rate structure and revenue increases on an inside city residential customer with a 5/8" meter with varying levels of usage.

Figure D: 5 Ccf Monthly Usage

	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
Fixed Charge	\$ 9.75	\$ 9.75	\$ 10.24	\$ 10.76	\$ 11.30	\$ 11.87
Volume Charge						
Tier 1 (0-2 Ccf)	5.58	5.58	5.82	6.06	6.32	6.64
Tier 2 (3-8 Ccf)	11.73	11.73	12.33	12.96	13.62	14.31
Tier 3 (Above 8 Ccf)	-	-	-	-	-	-
Total	\$ 27.06	\$ 27.06	\$ 28.39	\$ 29.78	\$ 31.24	\$ 32.82
		0.00%	4.92%	4.90%	4.90%	5.06%

Figure E: 10 Ccf Monthly Usage

	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
Fixed Charge	\$ 9.75	\$ 9.75	\$ 10.24	\$ 10.76	\$ 11.30	\$ 11.87
Volume Charge						
Tier 1 (0-2 Ccf)	5.58	5.58	5.82	6.06	6.32	6.64
Tier 2 (3-8 Ccf)	31.28	23.46	24.66	25.92	27.24	28.62
Tier 3 (Above 8 Ccf)		15.64	16.44	17.28	18.16	19.08
Total	\$ 46.61	\$ 54.43	\$ 57.16	\$ 60.02	\$ 63.02	\$ 66.21
		16.78%	5.02%	5.00%	5.00%	5.06%

INTRODUCTION

BACKGROUND OF THE STUDY

In 2018, Columbia Water and Light (CWL) engaged Raftelis to conduct a Water Financial Plan Study (Study) to develop a solvent financial plan for the water enterprise and to establish water rates that are equitable and sufficient to meet the utility's future needs.

Objectives of the Study

The major objectives of the study include the following:

- » Develop financial plans for the water enterprise to ensure financial sufficiency, meet operation and maintenance (O&M) costs, ensure sufficient funding for capital replacement and refurbishment (R&R) needs, and improve the financial health of the enterprise
- » Ensure adequate coverage and future revenues for a new bond issue
- » Review current and potential future rate structures for the water enterprise

RATE STUDY OVERVIEW

There are three phases in executing the comprehensive rate study:

1. Financial Plan
2. Cost of Service Analysis
3. Rate Design

Financial Plan

The general objective of the financial planning process is to arrive at the level of water rate revenue required **to provide for the financial sustainability** of the utility into the future.

For this study, the financial plan was developed for the current fiscal year (FY 18) and a five-year forecast period (FY19 – FY23). The five-year forecast period allows CWL to evaluate trends over time and evaluate the impact of challenges that occur beyond FY18. Separate financial plans for the water and electric utilities should be developed **to provide the water utility with the resources that are needed to operate self-sustainingly**.

Cost of Service Analysis

While the financial planning process determines the overall level of rate revenue necessary to sustain each utility, the cost of service analysis determines how that revenue should be recovered from the CWL customer classes. CWL has the following customer classes:

- » Residential (inside/outside city/water district)
- » Commercial (inside/outside city/water district)
- » Large Commercial (inside city)
- » Master Meter (inside/outside city/water district)
- » Residential Irrigation (inside/outside city/water district)
- » Commercial Irrigation (inside/outside city/water district)

For the water utility, costs are allocated on the basis of average and peak demand. Average demand represents water consumption on an average day, while peak demand represents the highest usage day and hour. To serve both types of demand, the water utility system must be built to provide water for both the average days and the peak days and hours. Consequently, customers who use water *more* consistently (those with lower peak demand to average demand ratio) cause the utility to incur *less* costs to provide service than customers who use water *less* consistently (those with higher peak demand to average demand ratio) cause the utility to incur *more* costs to provide service.

Rate Design

Once revenue requirements were identified and costs of operating the system properly allocated to customer classes, alternative rate structures were developed. The purpose of the rate design was to improve upon the current rate structure so that it would meet future revenue requirements of the water utility, appropriately allocating costs to customer classes and addresses the rate setting objectives identified by CWL staff, the CWL advisory board, and the Columbia City Council.

Fee and Policy Review

When a new customer connects to the utility they pay several fees depending on how they are connected to the system. These fees may include a system equity fee, an appurtenance fee, and a connection fee. The system equity fee is based on the concept that existing users have built a system with some value and new customers should pay some charge to put them on an equivalent equity basis with the new customers. Raftelis reviewed CWL's equity charges under the system buy in approach. This method is appropriate for utility systems with additional capacity already in place and provides an estimate of the cost of providing a unit of capacity based on the net equity of the existing assets. It calculates a system equity charge based on the proportional cost of each user's, both existing and future, share of the existing system capacity. The analysis found that the CWL's existing equity charges, as shown in the table below, were consistent with what was calculated under the system buy in approach.

Meter Size	System Equity Fee
5/8"	\$576.00
3/4"	\$576.00
1"	\$576.00
1-1/2"	\$1,296.00
2"	\$2,303.00
3"	\$5,182.00
4"	\$9,213.00
6"	\$20,729.00

It should be noted that while the City expects to make some significant improvements to the existing system in the next several years, it will be primarily debt funded which does not increase the equity in the system until the debt is paid for, new customers will share in the cost of the improvements through the payment of debt service.

The other fees paid by new customers, including the connection fee and appurtenance fee, are costs incurred by the utility to physically connect customers to the water distribution system. Based on discussion with City Staff these fees are updated by City Staff on a periodic basis based on the actual labor and material costs for performing these services. This approach is consistent with industry practice and we recommend the City continue this approach.

Raftelis also reviewed CWL's master meter policy, which places all properties with four or more units in the master meter customer class and requires them to pay the corresponding rate. This practice is within industry guidelines and meets cost of service principles. Raftelis does not recommend a change in policy.

RATE SETTING OBJECTIVES

An important part of the Study was to establish the rate setting objectives considered most important by CWL staff, the CWL advisory board (WLAB), and the Columbia City Council. Raftelis conducted separate work sessions with each group to determine the relative level of importance of each potential objective identified during the work sessions. Figure 1 lists the different objectives Raftelis discussed with work session attendees. A description of the rate setting objectives can be found in Figure 2.

Figure 1: Rate Setting Objectives



Attendees of each work session were provided worksheets and asked to rate each objective as “Essential”, “Very Important”, “Important” or “Least Important”. After the exercise was completed, the individual worksheets were used to determine which three objectives were deemed most essential to the attendees of each work session.

Figure 2: Description of Potential Rate Setting Objectives

Rate Setting Objectives	Description
Affordability	A properly designed rate structure combined with other mechanisms (e.g. rebates, water audits, and payment arrangements) can be used to meet affordability objectives.
Conservation / Demand Management	The rate structure should encourage conservation as well as assist in managing system demand.
Cost of Service Based Allocations	The rate structure should ensure that each customer class is contributing equitably towards revenue requirements based upon the costs of providing service to each customer class.
Ease of Implementation	The rate structure should be compatible with existing billing system. In addition, the rate structure should allow for the continuation of existing management and system reports.
Economic Development	The rate structure should incorporate a preferential rate that may be used to attract economic development.
Equitable Contributions from New Customers	New customers should be responsible for the capital costs of providing them service.
Minimization of Customer Impacts	The rate structure should be developed such that adverse rate impacts on each customer class are minimized.
Rate Stability	The rate structure should minimize dramatic rate increases or decreases over the planning period.
Revenue Stability	The rate structure should provide for a steady and predictable stream of revenues to the CWL such that the CWL is capable of meeting its current financial requirements.
Simple to Understand and Update	The rate structure should be easy for customers to understand, utilizing a moderate level of educational tools. In addition, the rate structure should be able to be effectively maintained by staff in future years.
Sustainability	The rate structure and level of revenue recovery should ensure adequate funds for ongoing repair and replacement of infrastructure to promote a sustainable system.

The rankings of the rate setting objectives provided the CWL staff and Raftelis team with direction as decisions were made throughout the rate design process. Although these results did not dictate the selection of the proposed rate structures, they did provide valuable guidance as the team sought to incorporate the values of the community into the rate design process. The rankings from WLAB and City council can be found in Figure 3.

Figure 3: Objective Rankings

WLAB	City Council	
Cost of Service Based Allocations	Cost of Service Based Allocations	Most Important
Revenue Stability	Affordability	
Affordability	Conservation/Demand Management	
Conservation/Demand Management	Rate Stability	
Rate Stability	Equitable Contributions from New Customers	Important
Equitable Contributions from New Customers	Minimization of Customer Impacts	
Simple to Understand and Update	Revenue Stability	
Minimization of Customer Impacts	Simple to Understand and Update	Least Important
Economic Development	Ease of Implementation	
Ease of Implementation	Economic Development	

REVENUE REQUIREMENTS

Revenue requirements for the water utility were calculated for the current fiscal year (FY18) and for the five-year forecast period: FY19 through FY23. Requirements for the water utility are comprised of four components:

- » Operation and maintenance (O&M) expenses,
- » Annual enterprise funded capital projects,
- » Debt service payments,
- » Transfers to the City of Columbia General Fund, and
- » Cash reserve policy requirements.

CWL staff revised capital improvement plans and future budgets and worked with Raftelis to develop a final plan that allows CWL to continue to operate at high standards while balancing the need for rate increases with affordability concerns.

FORECAST O&M EXPENSES

Internal budgets provided by CWL are the basis for the forecast of water utility O&M expenses. Raftelis reviewed current escalation factors used by CWL staff in their forecasts and found them to be in line with Raftelis's experience with similar communities.

Figure 3 summarizes the forecast O&M expenses for the water utility.

Figure 3: Forecast of O&M Expenses

<u>Department</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
Water Administration	\$ 471,520	\$ 532,432	\$ 547,228	\$ 562,543	\$ 578,399	\$ 594,823
Rate Analysis	57,759	483,937	486,616	489,348	492,135	494,978
Utility Services	38,963	36,968	37,707	38,462	39,231	40,015
Water Engineering	716,782	1,011,543	1,031,774	1,052,409	1,073,458	1,094,927
Other Overhead Charges	2,579,285	2,682,004	2,750,553	2,854,119	3,019,723	3,143,581
Production Plant	4,794,889	5,307,289	5,409,070	5,513,249	5,619,882	5,729,032
Trans and Distr Operations	5,605,457	5,193,567	5,094,199	5,200,110	5,308,322	5,418,888
Storeroom	246,278	223,394	227,862	232,419	237,067	241,809
Meter Testing and Maint	42,268	197,801	201,757	205,792	209,908	214,106
Meter Reading	224,266	207,363	211,510	215,740	220,055	224,456
PILOT	4,130,674	4,782,703	5,081,036	5,398,431	5,736,128	6,095,455
Total	\$ 18,908,141	\$ 20,659,001	\$ 21,079,314	\$ 21,762,622	\$ 22,534,310	\$ 23,292,069

CWL is required by city ordinance 27-128 to make a payment in lieu of taxes (PILOT). There are two components of this payment. The first is based on revenue and has a dedicated source of income in a separate line item on a customer's bill equal to 7.65% of their total water charges. The second is based on property values. This amount is projected to increase from approximately \$2.4 million in 2018 to \$3.9 million in 2023, an increase of 62%.

CAPITAL IMPROVEMENTS

Large water capital expenditures are projected between FY18 and FY23. The large majority of the expenditures are part of the major rehabilitation of the water treatment plant included in CWL long term planning documents, as well as upgrades to the West Ash pumping station and a new southeast pumping station.

CWL plans to fund water utility capital from three sources:

- Debt issuance,
- Enterprise revenue, and
- Fund balance in the existing water reserve fund.

CWL anticipates spending approximately \$42 million from FY19 to FY23 on capital projects. Over half of this amount is for the water treatment plant rehabilitation from 24 MGD to 32 MGD. The majority of the funding for these projects will come from debt issuances. CWL plans to spend \$600 thousand per year from enterprise revenues as well.

Debt Service Payments

Figure 4 shows CWL's existing and proposed debt service payments for the forecast period. Raftelis worked with CWL staff to analyze the impacts of multiple debt issuance scenarios. Under the proposed plan, CWL would issue a \$16 million bond in 2019 and a \$27 million bond in 2021³.

Figure 4: Debt Service Payments

Water	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
Revenue Bonds						
Existing	\$5,581,674	\$ 5,584,589	\$ 5,595,421	\$ 5,611,579	\$ 5,615,086	\$ 5,629,111
Proposed	-	340,000	953,572	1,527,322	2,562,725	2,562,725
Total Debt Service	\$5,581,674	\$ 5,924,589	\$ 6,548,993	\$ 7,138,900	\$ 8,177,810	\$ 8,191,835

Figure 5: Total Revenue Requirements

Expenditure	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
O&M	\$ 18,908,141	\$ 20,659,001	\$ 21,079,314	\$ 21,762,622	\$ 22,534,310	\$ 23,292,069
Debt Service	5,581,674	5,924,589	6,548,993	7,138,900	8,177,810	8,191,835
Enterprise Funded Capital	3,600,000	600,000	600,000	600,000	600,000	600,000
Total	\$ 28,089,815	\$ 27,183,590	\$ 28,228,307	\$ 29,501,522	\$ 31,312,120	\$ 32,083,904

³ The financial plan assumes the first payment of each of these bond issues will be interest only.

EXISTING RATES AND REVENUES

CWL recovers the cost of operating the water utility via volumetric rates and fixed base charges. Figure 6 contains the existing retail water rate structure for residential customers. In accordance with the City Code requirements, outside city customers are charged a rate 1.33 times that of the inside city rate and former water district customers are charged 1.157 times the inside city rate.

Figure 6: Existing Residential Rate Structure

Meter Size	Base Charge	Fire Flow
5/8"	\$ 9.75	\$ 1.55
3/4"	9.75	1.55
1"	14.04	1.64
1 1/2"	28.25	2.38
2"	42.00	2.56
3"	147.00	6.15
4"	325.00	9.51
6"	700.00	19.03
8"	1,200.00	19.03

Volumetric Rate per Ccf		
Base Usage*	\$ 2.79	
Summer Usage	3.91	

EXISTING RATE REVENUES

Due to modest account growth and declining retail consumption, **water customer accounts and water consumption are forecasted to remain at their 2017 levels throughout the forecast period.** Using billing data provided by CWL, Raftelis calculated the level of volumetric rate revenue, base charge revenue, and total rate revenue forecast to be generated under CWL's existing rates for FY18 and the forecast period. Miscellaneous revenues include connection fees, backflow program fees, investment revenue, PILOT revenue, and other operating revenues. Figure 7 shows projected annual revenues under current rates and constant accounts and consumption.

Figure 7: Annual Revenues Under Existing Rates

	<u>Revenue</u>
Inside City	\$ 21,913,422
Outside City	615,433
Water District	756,941
Misc Revenues	3,748,782
Total	\$ 27,034,578

FINANCIAL PLAN

Figure 8 compares the forecast revenue based on existing water rates with the forecast revenue requirements. With forecasted revenues of just below \$27 million, the water utility cannot sufficiently recover the forecast revenue requirements of above \$27 million in the next fiscal year. Due to increasing capital spending in the future and the need to maintain a minimum fund balance, revenues at existing rates are insufficient beginning in FY18. **Raftelis recommends 5% annual rate increases for the remainder of the forecast period.**

Figure 8: Water Revenue Sufficiency

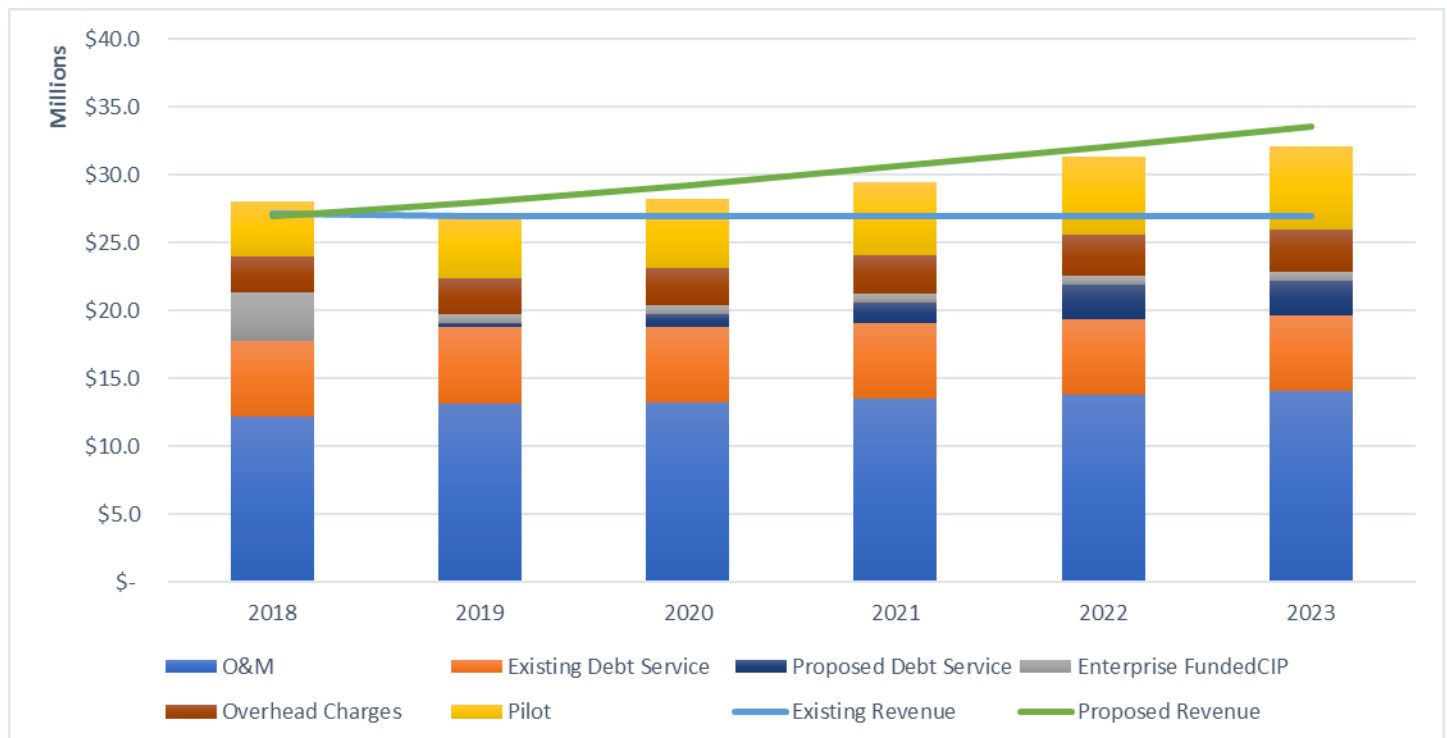


Figure 9 shows a forecast of revenues, expenditures, and operating reserve balances under the recommended rate increases. Target reserves are 20% of total O&M, debt service, and enterprise funded capital. Figure 10 shows a forecast of debt service coverage ratios that are an important factor in credit ratings. A coverage ratio is calculated by dividing net revenue (total revenue minus O&M expenses) by total debt service. CWL is required by bond covenant to maintain a utility wide (including electric) ratio of 1.25. It is a good practice, however, to ensure that each utility maintains a ratio of 1.25 on debt issued for its benefit to avoid one utility subsidizing the other.

Figure 9: Financial Plan

Annual Surplus/Deficit	2018	2019	2020	2021	2022	2023
Revenues	\$ 26,949,734	\$ 27,966,010	\$ 29,268,010	\$ 30,635,111	\$ 32,070,566	\$ 33,577,795
Expenditures	28,089,815	27,183,590	28,228,307	29,501,522	31,312,120	32,083,904
Surplus/(Deficit)	\$ (1,140,081)	\$ 782,420	\$ 1,039,703	\$ 1,133,589	\$ 758,446	\$ 1,493,890
Water Reserve Balance						
Beginning Balance	\$ 3,170,253	\$ 2,030,172	\$ 2,812,592	\$ 3,852,295	\$ 4,985,883	\$ 5,744,330
Surplus/(Deficit)	(1,140,081)	782,420	1,039,703	1,133,589	758,446	1,493,890
Ending Balance	\$ 2,030,172	\$ 2,812,592	\$ 3,852,295	\$ 4,985,883	\$ 5,744,330	\$ 7,238,220
Target Balance	\$ 5,436,718	\$ 5,645,661	\$ 5,900,304	\$ 6,262,424	\$ 6,416,781	\$ 6,339,760
Variance from Target	(3,406,546)	(2,833,070)	(2,048,010)	(1,276,541)	(672,451)	898,460

Figure 10: Financial Performance

DSCR - Water Utility	2018	2019	2020	2021	2022	2023
Parity Bonds						
Debt Service	\$ 5,581,674	\$ 5,924,589	\$ 6,548,993	\$ 7,138,900	\$ 8,177,810	\$ 8,191,835
Net Revenue Available	8,041,593	7,307,009	8,188,697	8,872,489	9,536,257	10,285,725
Parity DSCR	1.44	1.23	1.25	1.24	1.16	1.25
DSCR - Water and Light						
Parity Bonds						
Debt Service	\$ 16,897,625	\$ 17,240,575	\$ 17,871,347	\$ 18,448,997	\$ 19,493,125	\$ 19,512,706
Net Revenue Available	20,073,408	20,204,968	24,350,907	27,745,458	29,776,724	31,989,561
Parity DSCR	1.18	1.17	1.36	1.50	1.52	1.63

COST OF SERVICE

Following the development of the FY19 total revenue requirement, the proportion of the total revenue requirement (i.e. O&M and capital) allocable to each customer class must be determined. This allocation represents the level of revenues that must be recovered from each customer class, given the operational demands that class places on the water utility system. This allocation is performed via the following steps:

- » Cost Functionalization
- » Allocation of Functionalized Costs to Cost Components
- » Determination of Peaking Factors
- » Determination of Units of Service
- » Calculation of Unit Cost of Service
- » Determination of Revenue Requirements by Customer Class

Cost Functionalization

The first step in determining revenue requirements by customer class involves the allocation of water utility O&M and capital costs to functional categories. These categories relate to the various functions performed by the water utility system and staff in order to provide service to CWL customers. For this study the functions are:

- » Source of Supply
- » Treatment
- » Transmission
- » Distribution
- » Pumping
- » Meters
- » Customer Service
- » Fire Protection
- » Administration

Allocation of Water Utility O&M to Functional Categories

Figure 11 below summarizes the functional allocation of the water utility's FY19 O&M revenue requirement. These allocations relate to the proportion of expenditures in each cost center that is associated with performing each function. Meter Reading, for example, is associated with the cost of billing CWL's customers. Consequently, all O&M expenses for this cost center have been allocated to the Customer Service function. Water revenues other than rate revenue are subtracted from the O&M value to provide a total rate revenue requirement.

Figure 11: O&M Functionalization

Cost Center	Revenue Requirement	Source of Supply	Treatment	Transmission	Distribution	Pumping	Meters	Customer Service	Fire Protection	Administration
Water Administration	\$ 532,432									100.0%
Rate Analysis	483,937									100.0%
Utility Services	36,968									100.0%
Water Engineering	1,011,543	4.4%	7.9%	29.6%	38.0%	1.6%	13.9%	0.0%	2.0%	2.6%
Other Overhead Charges	2,129,408									100.0%
Customer Service	552,596							100.0%		
Production Plant	5,307,289		100.0%							
Trans and Distr Operations	5,193,567			43.8%	56.2%					
Storeroom	223,394									100.0%
Meter Testing and Maintenance	197,801						100.0%			
Meter Reading	207,363							100.0%		
PILOT	4,782,703									100.0%
Non-Rate Revenue	(3,048,782)									100.0%
Contribution to Reserves	782,420									100.0%
Total	\$ 18,392,638	\$ 44,576	\$ 5,386,713	\$ 2,574,855	\$ 3,303,348	\$ 16,253	\$ 338,036	\$ 759,959	\$ 20,042	\$ 5,948,856

Allocation of Water Utility Capital Costs to Functional Categories

Similar to the allocation of the O&M revenue requirement described in the previous section, the capital revenue requirement must be allocated to functional categories. Figure 12 indicates the functional allocation of capital costs. The basis for the allocation of capital costs was the existing level of water utility investment in fixed assets as of the end of FY17.

Figure 12: Capital Cost Functionalization

Cost Center	Revenue	Source of						Customer		Fire	
	Requirement	Supply	Treatment	Transmission	Distribution	Pumping	Meters	Service	Protection	Administration	
Enterprise Funded CIP	\$ 600,000	4.4%	7.9%	29.6%	38.0%	1.6%	13.9%	0.0%	2.0%	2.6%	
Existing Debt Service	5,584,589	4.4%	7.9%	29.6%	38.0%	1.6%	13.9%	0.0%	2.0%	2.6%	
Proposed Debt Service	340,000	4.4%	7.9%	29.6%	38.0%	1.6%	13.9%	0.0%	2.0%	2.6%	
Non-Rate Revenue	(700,000)	4.4%	7.9%	29.6%	38.0%	1.6%	13.9%	0.0%	2.0%	2.6%	
Total	\$ 5,824,589	\$ 256,672	\$ 457,333	\$ 1,726,827	\$ 2,215,391	\$ 93,586	\$ 807,493	\$ -	\$ 115,404	\$ 151,883	

Allocation of O&M, Capital Costs and Non-Rate Revenue to Cost Components

Once the O&M and capital costs have been allocated to the functional categories, the totals allocated to each functional category must be further allocated based on the operational need each function is designed to fulfill.

For this allocation, Raftelis has utilized the “Base Extra Capacity” method described in the American Water Works Association (“AWWA”) publication, “Manual of Water Supply Practices M1, Principles of Rates, Fees and Charges” (“AWWA M1”). The Base Extra Capacity Method involves allocating each of the functionalized O&M costs in accordance with operational need that function was designed to satisfy. The cost components can be generalized as pertaining to either the volumetric, customer service, or fire protection demand of water utility customers.

The volumetric cost components are: base demand (also known as average day demand), which relates to the water demand of CWL customers on an average day; max day extra capacity, or the level of demand in excess of base demand, demonstrated by CWL customers on the highest consumption day of the year, and maximum hour extra capacity, the theoretical demand, in excess of maximum day demand, demonstrated by CWL customers in the highest consumption hour.

The customer service related cost components are customer meters, services, and customer bills. These components relate to—at a minimum—the cost of reading customer meters and processing customer bills. Additionally, customer meter costs may also relate to the fixed investment in water utility assets associated with providing water service which is available (virtually at all times) regardless of how much water is consumed by CWL customers (i.e. “readiness to serve”).

The fire protection cost components are public fire hydrants. These costs relate to the theoretical demand of fire hydrants as well the costs associated with providing needed capacity to provide fire service.

The cost components are units of operating demand, which the various functions of the water utility system are designed to meet.

Figures 13 and 14 show the allocation of functionalized costs to cost components based on actual system historical demand.

Figure 13: Allocation of O&M to Cost Components

Function	Total	Base	Max Day	Max Hour	Bills	Meters	Fire
Source of Supply	44,576	44,576	-	-	-	-	-
Treatment	5,386,713	3,344,984	2,041,729	-	-	-	-
Transmission	2,574,855	1,598,906	975,949	-	-	-	-
Distribution	3,303,348	1,023,628	624,807	1,654,913	-	-	-
Pumping	16,253	5,036	3,074	8,142	-	-	-
Meters	338,036	-	-	-	-	338,036	-
Customer Service	759,959	-	-	-	759,959	-	-
Fire Protection	20,042	-	-	-	-	-	20,042
Administration	5,948,856	2,876,540	1,742,791	795,038	363,305	161,601	9,581
Total	18,392,638	8,893,670	5,388,349	2,458,094	1,123,264	499,638	29,623

Figure 14: Allocation of Capital Costs to Cost Components

Function	Total	Base	Max Day	Max Hour	Bills	Meters	Fire
Source of Supply	256,672	256,672	-	-	-	-	-
Treatment	457,333	283,990	173,343	-	-	-	-
Transmission	1,726,827	1,072,307	654,520	-	-	-	-
Distribution	2,215,391	686,496	419,027	1,109,868	-	-	-
Pumping	93,586	29,000	17,701	46,885	-	-	-
Meters	807,493	-	-	-	-	807,493	-
Customer Service	-	-	-	-	-	-	-
Fire Protection	115,404	-	-	-	-	-	115,404
Administration	151,883	62,343	33,859	30,971	-	21,620	3,090
Total	5,824,589	2,390,808	1,298,450	1,187,724	-	829,113	118,494

Determination of Customer Class Peaking Factors

Once each of the revenue requirements is allocated to the cost components, maximum day and hour peaking factors for each customer class are estimated. These are the basis upon which the maximum day and hour cost allocations, determined in the previous step, are allocated to each customer class. In general, the guidelines for determining maximum day and hour peaking factors outlined in AWWA M1 were the basis for this component of the analysis.

The maximum day demand for each customer class is estimated as the average consumption per day in the highest consumption month, divided by the annual average consumption per day, weighted by the ratio of maximum day demand to the average demand in the maximum month for the entire water system. In other words:

»
$$\text{System Max Day to Average Day in Max Month} = (\text{System Max Day Demand}) / (\text{System Max Month} / 30)$$

- » $\text{Class Maximum Day} = [(\text{Class Max Month}/30)/(\text{Class Annual Total})/365] * [\text{System Max Day to Average Day in Max Month}]$

The weighting occurs because the exact maximum day, by customer class is not known, but is assumed to have the same relationship to the average day in the maximum month as the entire system. As the exact customer class maximum hour is not known, a similar weighting process occurs to determine the customer class maximum hour demands:

- » $\text{System Max Hour to Average Day in Max Month} = (\text{System Max Hour})/(\text{System Max Month}/30)$
- » $\text{Class Maximum Hour} = \text{Class Max Day} * \text{System Max Hour to Average Day in Max Month}$

Determination of Water Units of Service

The next step in the cost allocation process is to summarize the units of service, which are the basis for the allocation of the total revenue requirement to each of the customer classes. The units are Base units, Maximum Day Extra Capacity units, Maximum Hour Extra Capacity units, Equivalent Meters and Total Bills and are indicated in Figure 15.

Base units are the annual consumption for each customer class. Maximum Day Extra Capacity units represent the water demand in excess of that which is used on an average day for that customer class, and is a function of the average daily consumption and the customer class peaking factor determined in the prior step.

As an example, the Residential class is forecast to use approximately 2.6 million Ccf on an annual basis in FY19. This equates to approximately 7,200 Ccf per day on an average day. Based on the maximum day peaking factor determined in the previous step, residential customers, on their highest consumption day of the year, typically use 1.68 times their average day consumption, or around 12,000 Ccf. The difference between the maximum day and average day, around 4,900 Ccf, represents that class's Maximum Day Extra Capacity units.

A similar calculation is used to determine the Maximum Hour Extra Capacity Units, which are simply the consumption forecast in the highest hour of FY19, less the maximum day demand.

Customer Units are equivalent meters, and customer monthly bills. The number of bills for each customer class was ascertained via an examination of the billing data from CWL. The equivalent meters are the number of customer meters at each meter size weighted by the potential water demand each meter can place on the water system. For CWL, a 5/8" meter is the current standard for residential services. The number of equivalent meters for sizes larger than 5/8" is determined by multiplying the nominal number of meters (the number at each connection size) by a meter factor, which represents the ratio of the flow rate of the larger meter, to that of the standard 5/8" meter. Once the number of equivalent meters which are larger than 5/8" is determined, this total is added to the number of 5/8" meters to arrive at the total number of equivalent meters.

Figure 15: Units of Service

	Base	Max Day	Max Hour	Bills	Eq. Meters	Fire
Inside City						
Residential	2,646,982	4,949	22,263	490,788	41,662	-
Commercial	1,027,572	1,417	7,723	41,832	8,840	-
Large Commercial	737,346	1,073	5,644	336	605	-
Master Meter	292,031	431	2,246	10,572	2,238	-
Residential Irrigation	47,298	318	816	3,108	580	-
Commercial Irrigation	252,343	1,791	4,530	9,432	1,784	-
Airport	2,154	10	29	156	61	-
Total	5,005,726	9,988	43,250	556,224	55,769	-
Outside City						
Residential	73,965	107	565	15,792	1,328	-
Commercial	5,232	6	38	468	140	-
Large Commercial	-	-	-	-	-	-
Master Meter	6,702	11	54	36	10	-
Residential Irrigation	27	1	1	36	5	-
Commercial Irrigation	14	0	1	84	28	-
Total	85,940	126	659	16,416	1,511	-
Water District						
Residential	106,167	304	1,086	18,180	1,523	-
Commercial	9,105	13	70	612	109	-
Large Commercial	-	-	-	-	-	-
Master Meter	25,039	69	252	720	131	-
Residential Irrigation	379	8	16	12	3	-
Commercial Irrigation	999	11	25	36	9	-
Total	141,689	406	1,448	19,560	1,774	-
Public Fire Protection	-	561	6,737	-	-	6,009
Total	5,233,355	11,081	52,095	592,200	59,053	6,009

Determination of Water Unit Cost of Service

Once each component of the FY19 revenue requirement (i.e. O&M and Capital) has been allocated to each of the cost components (i.e. base, max day etc.), the unit cost of service can be determined. The unit cost of service is the basis by which costs are allocated to each customer class.

Figure 16 provides an example of the determination of the unit cost of service.

The total system units are the sum of all of the units from Figure 19. Base units represent all retail customer use on an annual basis. Max day units represent the daily use, in excess of that which is used on an average day for all customer classes. Max hour use is that which is used in excess of max day consumption. Equivalent

meters are the nominal number of retail customer meters (i.e. 3/4", 2" etc.) multiplied by an equivalent meter factor.

Also shown is each of the revenue requirements, as they have been allocated to the cost components, and the unit cost for each component. As an example, the total O&M costs allocated to the "base" cost component is approximately \$8.9 million. Since there are 5.2 million base units, the cost per unit is \$1.70. This calculation is repeated for each of the cost components and revenue requirements to arrive at a total system unit cost for each cost component. These are the basis by which costs are allocated to customer classes.

Figure 16: Unit Cost of Service

Units Costs of Service	Total	Base	Max Day	Max Hour	Bills	Meters	Fire
Units of Service		5,233,355	11,081	52,095	592,200	59,053	6,009
Net Operating Expense							
<i>Total Cost</i>	\$ 18,392,638	\$ 8,893,670	\$5,388,349	\$2,458,094	\$1,123,264	\$ 499,638	\$ 29,623
<i>Unit Cost</i>		1.70	486.27	47.18	1.90	8.46	4.93
Net Capital Cost							
<i>Total Cost</i>	\$ 5,824,589	\$ 2,390,808	\$1,298,450	\$1,187,724	\$ -	\$ 829,113	\$ 118,494
<i>Unit Cost</i>		0.46	117.18	22.80	-	14.04	19.72
Total Unit Cost		2.16	603.45	69.98	1.90	22.50	24.65

Determination of Revenue Requirements by Customer Class

To determine the allocation of the FY19 revenue requirements to each of the customer classes, the total unit cost of service is multiplied by the units of service for that class. Figure 17 provides an example of the revenue requirements for the retail class. For example, \$5.7 million in base demand costs are allocated to inside CWL residential customers only, which is equal to the cost per unit of the base demand for inside CWL residential customers multiplied by the FY19 projected annual consumption for inside CWL residential customers.

Figure 17: Class Cost of Service

Inside City	Base	Max Day	Max Hour	Bills	Meters	Fire	Total
Residential	\$ 5,707,583	\$ 2,986,304	\$ 1,558,036	\$ 930,909	\$ 937,433	\$ -	\$ 12,120,265
Commercial	2,215,713	855,285	540,503	79,345	198,910	-	3,889,758
Large Commercial	1,589,910	647,373	394,966	637	13,613	-	2,646,500
Master Meter	629,695	259,867	157,164	20,053	50,346	-	1,117,125
Residential Irrigation	101,987	191,639	57,102	5,895	13,039	-	369,663
Commercial Irrigation	544,117	1,080,901	317,023	17,890	40,142	-	2,000,074
Airport	4,645	5,886	1,999	296	1,373	-	14,198
Total	\$ 10,793,650	\$ 6,027,256	\$ 3,026,793	\$ 1,055,026	\$ 1,254,857	\$ -	\$ 22,157,583
Outside City							
Residential	\$ 159,488	\$ 64,647	\$ 39,558	\$ 29,954	\$ 29,882	\$ -	\$ 323,528
Commercial	11,282	3,863	2,648	888	3,150	-	21,831
Large Commercial	-	-	-	-	-	-	-
Master Meter	14,451	6,867	3,798	68	225	-	25,410
Residential Irrigation	58	379	90	68	101	-	697
Commercial Irrigation	30	251	58	159	630	-	1,129
Total	\$ 185,309	\$ 76,008	\$ 46,152	\$ 31,137	\$ 33,988	\$ -	\$ 372,594
Water District							
Residential	\$ 228,924	\$ 183,651	\$ 76,008	\$ 34,483	\$ 34,258	\$ -	\$ 557,323
Commercial	19,633	8,029	4,885	1,161	2,453	-	36,160
Large Commercial	-	-	-	-	-	-	-
Master Meter	53,991	41,835	17,613	1,366	2,948	-	117,752
Residential Irrigation	817	4,708	1,129	23	56	-	6,733
Commercial Irrigation	2,154	6,500	1,725	68	191	-	10,638
Total	\$ 305,518	\$ 244,722	\$ 101,359	\$ 37,101	\$ 39,906	\$ -	\$ 728,606
Public Fire Protection	\$ -	\$ 338,813	\$ 471,514	\$ -	\$ -	\$ 148,117	\$ 958,444
Total System	\$ 11,284,478	\$ 6,686,800	\$ 3,645,818	\$ 1,123,264	\$ 1,328,751	\$ 148,117	\$ 24,217,228

RATE DESIGN

In addition to determining the level of revenue necessary for future sustainable operation of the utility, the existing and alternative rate structures were evaluated the rate setting objectives that were established with this study. Raftelis held a conceptual design work session with CWL staff to explore how CWL might restructure the rates. Raftelis also met with the CWL advisory board and the Columbia City Council, so that utility rate concerns reflected a broad range of viewpoints. From these meetings, a general consensus emerged. Stakeholders would like to see a rate structure that incentivizes water conservation.

PROPOSED RATE STRUCTURE

Fixed Charge

The fixed monthly charges consists of three components: customer cost, meter cost, and readiness to serve (RTS). The customer costs comprise those expenses associated with serving customers, irrespective of the

amount or rate of water use. They include, but are not limited to, meter reading, billing, customer accounting, customer service, and collecting expense. The meter cost includes maintenance and capital costs related to meters and services. The RTS component is based on the rationale that a minimum amount of distribution system investment and operation and maintenance (O&M) expenses are required to enable the system to be ready to serve. CWL makes investments to provide the ability to serve, and these costs must be recovered regardless of the amount of water used during a given period. Figure 18 shows the development of the fixed charge. Figure 19 shows a forecast of fixed charges through FY23 based on a 5% increase in required revenue.

Figure 18: Fixed Charge Development

<u>Meter Size</u>	<u>Customer Cost</u>	<u>Meter Cost</u>	<u>RTS</u>	<u>Total</u>
5/8"	2.01	1.80	5.94	9.75
3/4"	2.01	1.80	5.94	9.75
1"	2.01	4.51	7.52	14.04
1 1/2"	2.01	9.02	17.22	28.25
2"	2.01	14.44	25.55	42.00
3"	2.01	27.07	117.92	147.00
4"	2.01	45.12	277.87	325.00
6"	2.01	90.25	607.75	700.00
8"	2.01	144.39	1,053.60	1,200.00

Figure 19: Fixed Charge Forecast

<u>Inside City</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
5/8"	9.75	9.75	10.24	10.76	11.30	11.87
3/4"	9.75	9.75	10.24	10.76	11.30	11.87
1"	14.04	14.04	14.75	15.49	16.27	17.09
1 1/2"	28.25	28.25	29.67	31.16	32.72	34.36
2"	42.00	42.00	44.10	46.31	48.63	51.07
3"	147.00	147.00	154.35	162.07	170.18	178.69
4"	325.00	325.00	341.25	358.32	376.24	395.06
6"	700.00	700.00	735.00	771.75	810.34	850.86
8"	1,200.00	1,200.00	1,260.00	1,323.00	1,389.15	1,458.61

Volumetric Charge

CWL's current two-tier rate structure charges a higher rate in the summer months (June – September) once a customer crosses a certain level of base usage. Currently, the cutoff is 2 Ccf for residential customers and 70% of average winter consumption for the commercial, large commercial, and master meter classes. Usage below this cutoff, as well as all usage in months outside the summer period, is charged at a lower rate. Irrigation customers pay the higher rate on all usage during the summer months.

Raftelis proposes adding a third tier at a rate double the second tier. The third tier would apply to all usage above 8 Ccf for residential customers and all usage above 170% of average winter consumption for all other classes. Rather than implement a 5% increase across the board for all CWL customers, this structure

would recover more costs from the customers who place the highest demands on the system and send a strong signal that CWL favors water conservation by charging a higher rate for discretionary usage.

Bill frequency analyses show that this rate structure would recover approximately 5% more revenue than the existing structure. In the summer months, approximately 20% of residential bills have consumption above 8 Ccf per month. The forecast recognizes the elasticity of demand for water and expects that the total amount of consumption above 8 Ccf would fall by 25% when the third tier is implemented.

The proposed rate forecast is shown in Figure 20 based on a 5% annual increase in required revenue. The proposed structure would also bring the Tier 1 Commercial rate in line with the residential rate by 2023.

Under this structure, approximately 31% of rate revenue will be from base charges and 69% from volume charges. This is a reasonable distribution in line with industry standards and balances the need for revenue stability with affordability concerns.

Figure 20: Volumetric Rate Forecast

Inside City	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
<i>Residential</i>						
Tier 1 (0-2 Ccf)	\$ 2.79	\$ 2.79	\$ 2.91	\$ 3.03	\$ 3.16	\$ 3.32
Tier 2 (3-8 Ccf)	3.91	3.91	4.11	4.32	4.54	4.77
Tier 3 (Above 8 Ccf)	-	7.82	8.22	8.64	9.08	9.54
<i>Commercial</i>						
Tier 1 (0-70% AWC)	2.63	2.63	2.79	2.96	3.14	3.32
Tier 2 (71% - 170% AWC)	3.91	3.91	4.11	4.32	4.54	4.77
Tier 3 (Above 170% AWC)	-	7.82	8.22	8.64	9.08	9.54
<i>Large Commercial</i>						
Tier 1 (0-70% AWC)	2.45	2.63	2.79	2.96	3.14	3.32
Tier 2 (71% - 170% AWC)	3.91	3.91	4.11	4.32	4.54	4.77
Tier 3 (Above 170% AWC)	-	7.82	8.22	8.64	9.08	9.54
<i>Residential Irrigation</i>						
Tier 1 (Off Season)	2.79	2.79	2.91	3.03	3.16	3.32
Tier 2 (Summer)	3.91	7.82	8.22	8.64	9.08	9.54
<i>Commercial Irrigation</i>						
Tier 1 (Off Season)	2.63	2.63	2.79	2.96	3.14	3.32
Tier 2 (Summer)	3.91	7.82	8.22	8.64	9.08	9.54
<i>Master Meter</i>						
Tier 1 (0-70% AWC)	2.79	2.79	2.91	3.03	3.16	3.32
Tier 2 (71% - 170% AWC)	3.91	3.91	4.11	4.32	4.54	4.77
Tier 3 (Above 170% AWC)	-	7.82	8.22	8.64	9.08	9.54

CUSTOMER IMPACTS

The following Figures show the impact of the new rate structure and revenue increases on the typical water bill of an inside city residential customer with a 5/8" meter with varying levels of usage.

Figure 21: 5 Ccf Monthly Usage

	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
Fixed Charge	\$ 9.75	\$ 9.75	\$ 10.24	\$ 10.76	\$ 11.30	\$ 11.87
Volume Charge						
Tier 1 (0-2 Ccf)	5.58	5.58	5.82	6.06	6.32	6.64
Tier 2 (3-8 Ccf)	11.73	11.73	12.33	12.96	13.62	14.31
Tier 3 (Above 8 Ccf)	-	-	-	-	-	-
Total	\$ 27.06	\$ 27.06	\$ 28.39	\$ 29.78	\$ 31.24	\$ 32.82
		0.00%	4.92%	4.90%	4.90%	5.06%

Figure 22: 10 Ccf Monthly Usage

	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
Fixed Charge	\$ 9.75	\$ 9.75	\$ 10.24	\$ 10.76	\$ 11.30	\$ 11.87
Volume Charge						
Tier 1 (0-2 Ccf)	5.58	5.58	5.82	6.06	6.32	6.64
Tier 2 (3-8 Ccf)	31.28	23.46	24.66	25.92	27.24	28.62
Tier 3 (Above 8 Ccf)		15.64	16.44	17.28	18.16	19.08
Total	\$ 46.61	\$ 54.43	\$ 57.16	\$ 60.02	\$ 63.02	\$ 66.21
		16.78%	5.02%	5.00%	5.00%	5.06%

Figure 23: 15 Ccf Monthly Usage

	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
Fixed Charge	\$ 9.75	\$ 9.75	\$ 10.24	\$ 10.76	\$ 11.30	\$ 11.87
Volume Charge						
Tier 1 (0-2 Ccf)	5.58	5.58	5.82	6.06	6.32	6.64
Tier 2 (3-8 Ccf)	50.83	23.46	24.66	25.92	27.24	28.62
Tier 3 (Above 8 Ccf)		54.74	57.54	60.48	63.56	66.78
Total	\$ 66.16	\$ 93.53	\$ 98.26	\$ 103.22	\$ 108.42	\$ 113.91
		41.37%	5.06%	5.05%	5.04%	5.06%

COMPARISON TO SIMILAR COMMUNITIES

Figures 24 through 26 show bills for 5 Ccf, 10 Ccf, and 15 Ccf of water consumption in similarly sized communities in the region and major cities in Missouri at current 2018 rates.

Figure 24: 5 Ccf Bill in Similar Communities

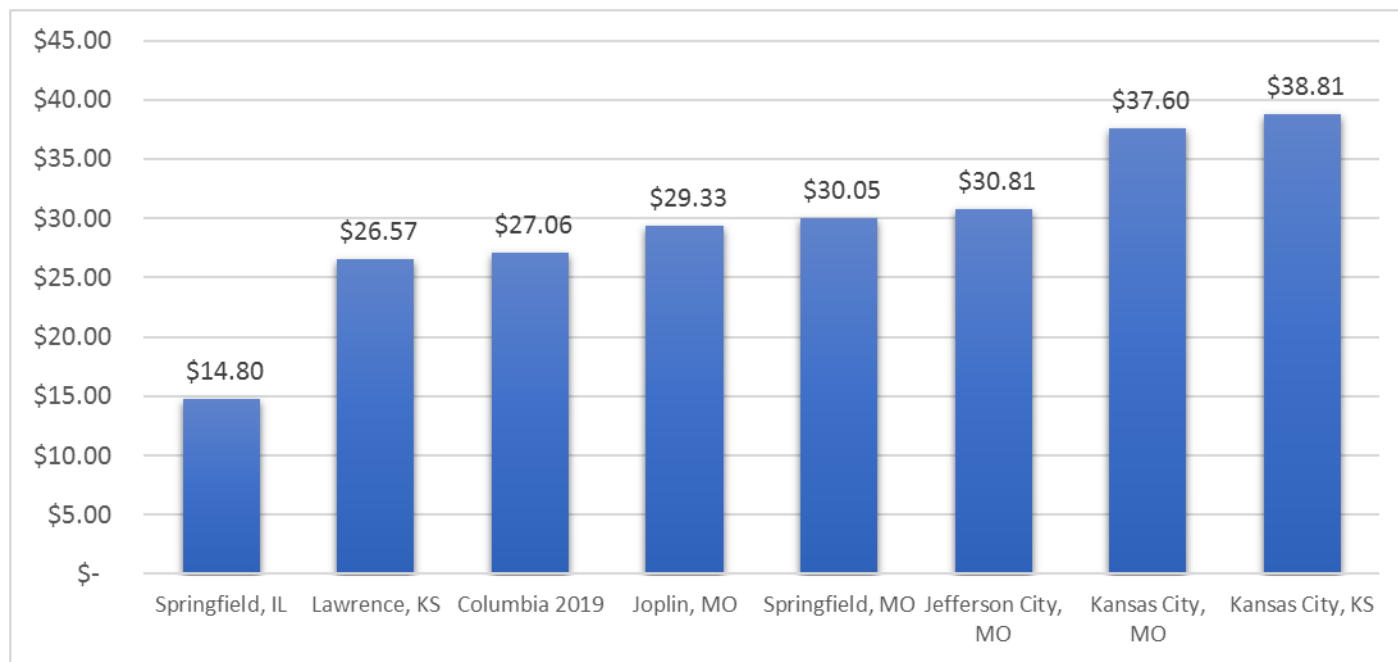


Figure 25: 10 Ccf Bill in Similar Communities

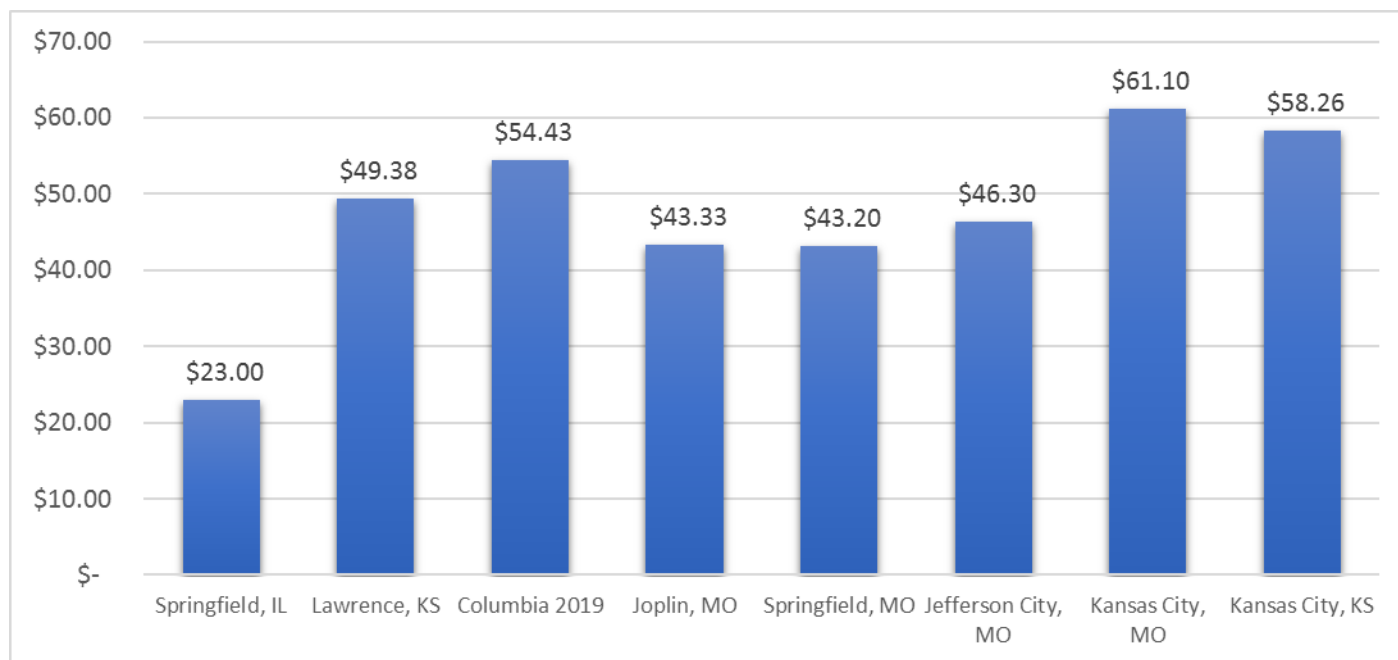


Figure 26: 15 Ccf Bill in Similar Communities

